LUNG CANCER

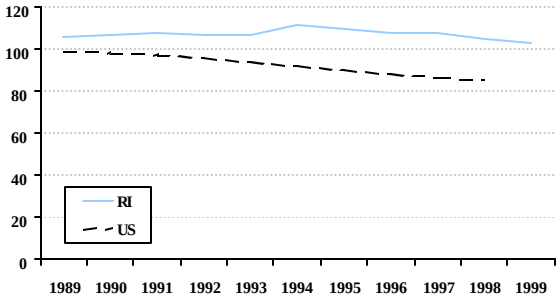
Lung cancer originates in the tissues of the lungs. Most cases of lung cancer can be described by one of two separate categories: small cell lung cancer and non-small cell lung cancer. Small cell lung cancer (about 20% of lung cancer cases), as the name implies, deals with the type of lung cancer with cells that are smaller than the average cancer cell. These small cells rapidly reproduce to form large tumors that can spread to other parts of the body. This type of lung cancer is often associated with smoking or secondhand smoke. The most common type of lung cancer is the slower-growing non-small cell lung cancer (nearly 80% of all cases). This category of lung cancer can be further divided into three subcategories: squamous cell carcinoma, adenocarcinoma, and large cell carcinomas. (RICAN)

Lung cancer is the second most commonly diagnosed cancer among Rhode Islanders (annual average of 490 male and 397 female newly diagnosed cases in each of the five years 1997-2001), accounting for 15% of all newly diagnosed cancers in 1997-2001. Lung cancer is the leading cause of cancer death in RI (annual average of 403 male and 300 female deaths in each of the five years 1996-2000), accounting for 29% of all cancer deaths in 1996-2000. In Rhode Island, approximately 1,500 people alive today were diagnosed with lung cancer at some point in the past 25 years (750 males and 826 females in 2000). (RICR)

Cancer Rates

Figure 9-1. Male lung cancer incidence by year

Average annual invasive lung cancer incidence rates** by year among males, RI and US, 1987-2001***.*



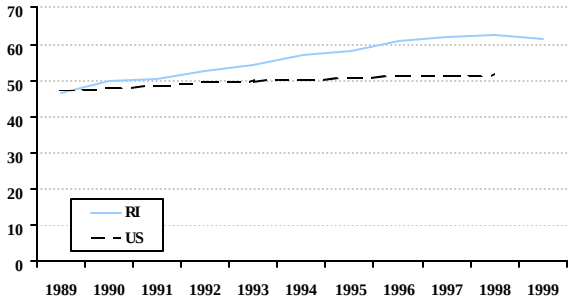
* Invasive includes the following stages of disease at diagnosis: local, regional, distant, and unknown.
** Rates are age-adjusted to the year 2000 US standard population, expressed as cases per 100,000 population.
*** Rates are five-year moving averages.
Source: RICR, HEALTH – calculated with *SEER*Stat; SEER Cancer Statistics Review 1973-1999;* 1999 US data is from SEER Public-Use 1973-2000 Data – calculated with *Seer*Stat.*

The age-adjusted incidence of invasive lung cancer among RI males of all races increased from 105 cases per 100,000 males in 1989 to 111 cases per 100,000 males in 1994, followed by a decrease to 102 cases per 100,000 males in 1999 (based on five-year moving averages). In contrast, the age-adjusted incidence of invasive lung cancer among US males of all races decreased from about 99 cases per 100,000 males in 1989 to about 85 cases per 100,000 males in 1998 (based on five-year moving averages).

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-2. Female lung cancer incidence by year

Average annual invasive lung cancer incidence rates** by year among females, RI and US, 1987-2001***.*



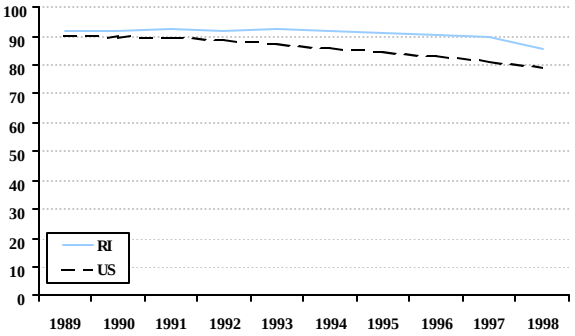
* Invasive includes the following stages of disease at diagnosis local, regional, distant, and unknown.
** Rates are age-adjusted to the year 2000 US standard population, expressed as cases per 100,000 population.
*** Rates are five-year moving averages.
Source: RICR, HEALTH – calculated with *SEER*Stat*; *SEER Cancer Statistics Review 1973-1999;* 1999 US data is from SEER Public-Use 1973-2000 Data – calculated with *Seer*Stat*.

The age-adjusted incidence of invasive lung cancer among RI females of all races increased from 46 cases per 100,000 females in 1989 to 61 cases per 100,000 females in 1999 (based on five-year moving averages). Similarly, the age-adjusted incidence of invasive lung cancer among US females of all races increased from 47 cases per 100,000 females in 1989 to 52 cases per 100,000 females in 1998 (based on five-year moving averages).

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-3. Male lung cancer mortality by year

Average annual lung cancer mortality rates by year among males, RI and US, 1987-2000**.*



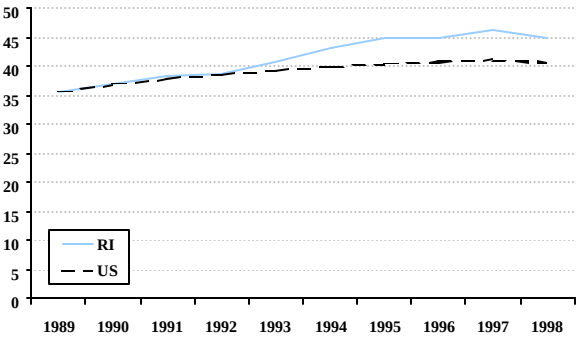
* Rates are age-adjusted to the year 2000 US standard population, expressed as deaths per 100,000 population.
** Rates are five-year moving averages.
Source: CDC WONDER, CDC; 1998 US data from SEER US Mortality 1969-2000 Data – calculated with *SEER*Stat*.

The age-adjusted mortality of invasive lung cancer among RI males of all races was 92 deaths per 100,000 in 1989 and 86 deaths per 100,000 in 1998 (based on five-year moving averages). This may suggest an initial decline in lung cancer mortality rates among RI men. The age-adjusted mortality of invasive lung cancer among US males of all races declined from 90 in 1989 to 80 in 1998 (based on five-year moving averages).

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-4. Female lung cancer mortality by year

Average annual lung cancer mortality rates by year among females, RI and US, 1987-2000**.*



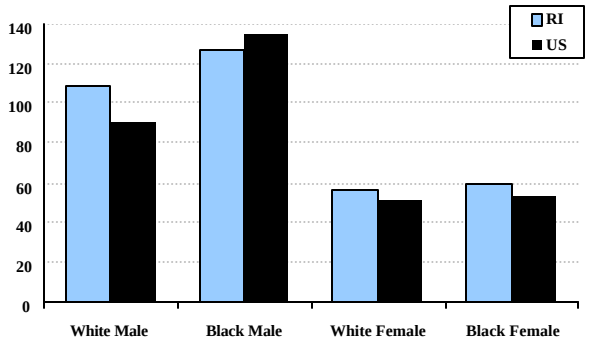
* Rates are age-adjusted to the year 2000 US standard population, expressed as deaths per 100,000 population.
** Rates are five-year moving averages.
Source: CDC WONDER, CDC; 1998 US data from SEER US Mortality 1969-2000 Data – calculated with *SEER*Stat*.

The age-adjusted mortality of invasive lung cancer among RI females of all races increased from 36 deaths per 100,000 in 1989 to 45 deaths per 100,000 in 1998 (based on five-year moving averages). Similarly, the age-adjusted mortality of invasive lung cancer among US females of all races increased from 36 in 1989 to 41 in 1998 (based on five-year moving averages).

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-5. Lung cancer incidence by race and sex

Average annual invasive lung cancer incidence rates by race and sex, RI and US, 1987-2000.*



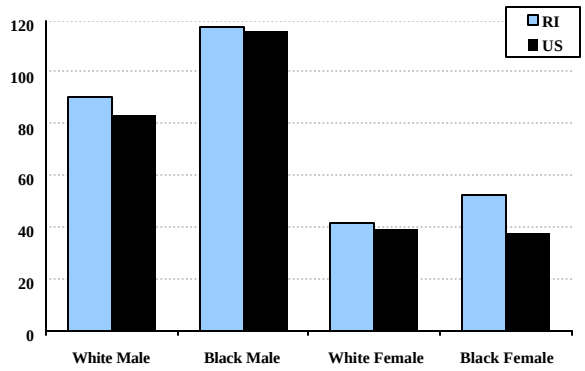
* Rates are age-adjusted to the year 2000 US standard population, expressed as cases per 100,000 population.
Source: RICR, HEALTH; SEER Public-Use 1973-2000 Data; calculated with *SEER*Stat*.

In 1987-2000, lung cancer incidence rates in RI were higher among black males (127 cases per 100,000) than white males (108 cases per 100,000). US male rates were also higher among black males. Female lung cancer incidence rates during this period were slightly higher among black female (59 cases per 100,000) than white females (56 cases per 100,000), and the same was true among US females.

[Note: RI incidence data for 2001 is currently available. US incidence data is only available through 2000. For comparability, the figure at left contains RI data through 2000.]

Figure 9-6. Lung cancer mortality by race and sex

Average annual lung cancer mortality rates by race and sex, RI and US, 1987-2000.*

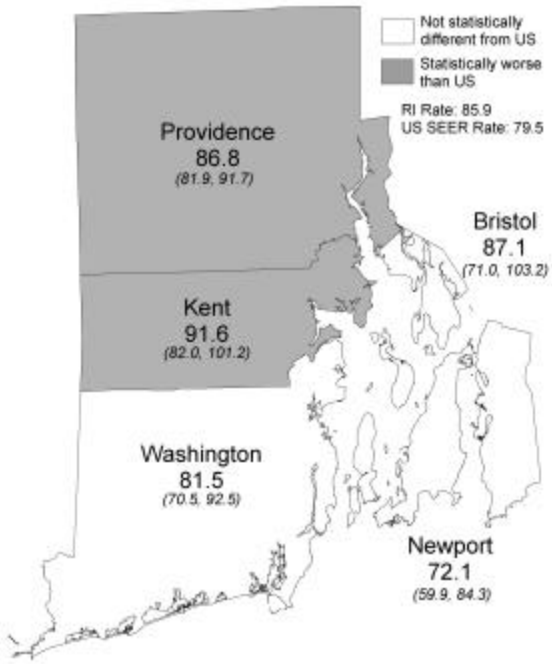


* Rates are age-adjusted to the year 2000 US standard population, expressed as deaths per 100,000 population.
Source: Office of Vital Records, HEALTH; SEER US Mortality 1969-2000 Data; calculated with *SEER*Stat*.

In 1987-2000, lung cancer mortality rates in RI were higher among black males (118 deaths per 100,000) than white males (90 deaths per 100,000). US male rates were also higher among blacks. Female lung cancer mortality rates during this period were higher among black females (63 deaths per 100,000) than white females (42 deaths per 100,000) in RI. US lung cancer mortality rates were similar for white and black females.

Figure 9-5. Male lung cancer mortality by county

Average annual lung cancer mortality rates among males by county and statistical difference from US rates, RI, 1996-2000.*



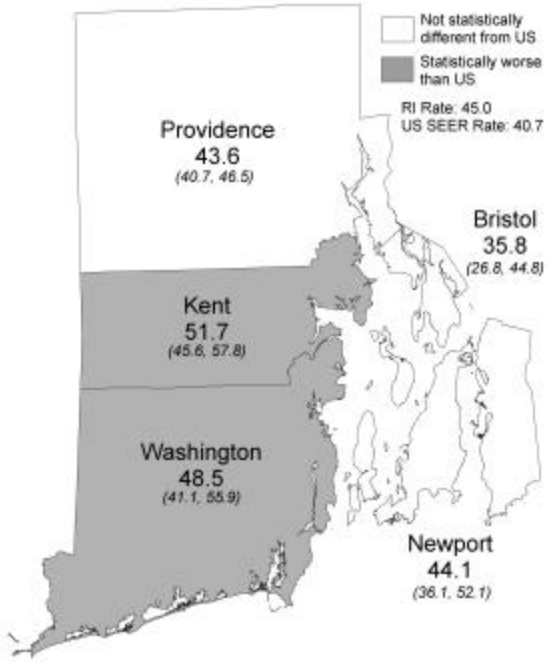
In 1996-2000, average annual lung cancer mortality rates among males in Providence county (87 deaths per 100,000) and Kent county (92 deaths per 100,000) were significantly higher than the US rate. (80 deaths per 100,000)

[Note: Maps are color-coded based on comparison to US mortality rates. When the US rates fall within the 95% confidence interval (shown in parentheses), it suggests that there is no statistical difference. Please see Key for Maps in **About the Data** (section 3) for a clear delineation of counties.]

* Rates are age-adjusted to the year 2000 US standard population, expressed as deaths per 100,000.
Data source: Office of Vital Records, HEALTH; calculated with *SEER*Stat* .
Map source: HEALTH gis.

Figure 9-6. Female lung cancer mortality by county

Average annual lung cancer mortality rates among females by county and statistical difference from US rates, RI, 1996-2000.*



In 1996-2000, average annual lung cancer mortality rates among females in Kent county (52 deaths per 100,000) and Washington county (49 deaths per 100,000) were significantly higher than the US rate (41 deaths per 100,000).

[Note: Maps are color-coded based on comparison to US mortality rates. When the US rates fall within the 95% confidence interval (shown in parentheses), it suggests that there is no statistical difference. Please see Key for Maps in **About the Data** (section 3) for a clear delineation of counties.]

* Rates are age-adjusted to the year 2000 US standard population, expressed as deaths per 100,000.
Data source: Office of Vital Records, HEALTH; calculated with *SEER*Stat* .
Map source: HEALTH gis.

Healthy People 2010 **Targets**
Mortality: By 2010, reduce the lung cancer death rate to 44.9 deaths per 100,000 population (age-adjusted to the year 2000 standard population of the United States; baseline = 57.6 deaths per 100,000 population in 1998).

Risk Factors

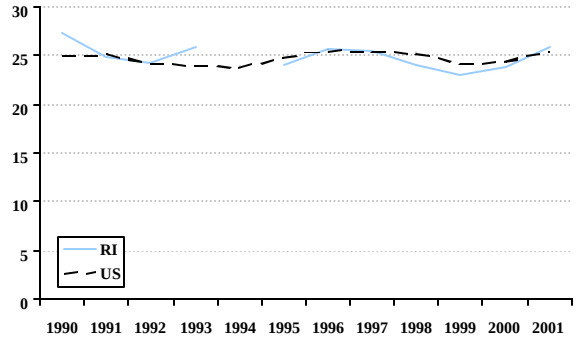
In 1964, the first Surgeon General's Report on Smoking and Health recognized cigarette smoking as a cause of cancer. (Smoking) Since that time, more than 20 Surgeon General's reports (NIH) and countless studies have confirmed that both cigarette smoking and exposure to environmental tobacco smoke cause lung cancer. (HP) In fact, 87% of lung, trachea, and bronchus cancers are associated with tobacco use. (Clinical) Certain environmental carcinogen exposures are also important risk factors for lung cancer.

Prevention

Lung cancer is a preventable cause of death, and with no effective screening procedures or treatments, the reduction of tobacco use is crucial. (HP) The American Cancer Society suggests that the best way to prevent lung cancer is to not smoke and to avoid people who do. (ACS) If you already smoke, you should quit. You should also avoid breathing in other people's smoke. Clinicians should advise all patients to avoid tobacco smoke. (Clinical)

Figure 9-9. Male current smokers by year

Percent of male respondents 18 and older who have ever smoked 100 cigarettes in their lifetime and reported smoking every day or some days by year, RI and US, 1990-2001.



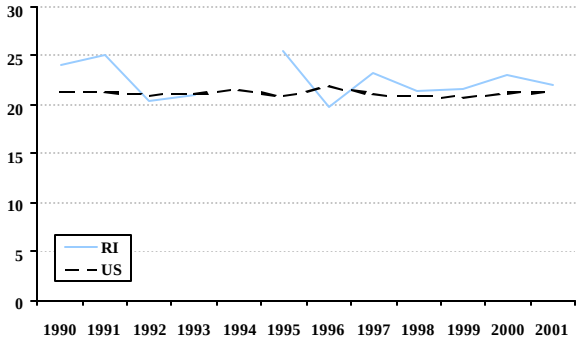
Source: RI -BRFSS, HEALTH; BRFSS, CDC

From 1990 through 2000, the proportion of RI males who had reported being a current smoker varied between 23% and 27%, showing no definite trend. The median proportion of US males who had reported being a current smoker remained at around 25% for the entire period of observation.

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-10. Female current smokers by year

Percent of female respondents 18 and older who have ever smoked 100 cigarettes in their lifetime and reported smoking every day or some days by year, RI and US, 1990-2001.



Source: RI-BRFSS, HEALTH; BRFSS, CDC

From 1990 through 2001, the percent of RI females who had reported being a current smoker varied between 20% and 25%. Among all the states, in comparison, the median proportion of US females who reported being a current smoker hovered around 21%.

[Note: Separate graphs for males and females may not have the same y-axis scale.]

***Healthy People 2010* Targets**
Current Smokers: By 2010, reduce cigarette smoking by adults aged 18 years and over to 12% (baseline = 24% in 1998), and reduce tobacco use by students in grade 9 through 12 to 21% (baseline = 40% in 1998).

Screening

Some studies find that lung cancer caught early is more responsive to treatment. For this reason, the use of x-ray and CAT scan has been debated and is being studied. However, according to clinical guidelines, "Routine screening for lung cancer with chest radiography or sputum cytology in asymptomatic persons is not recommended." (Clinical) Because systematic screening for lung cancer is not recommended in the US, nor is practiced in RI, we would not expect trends in stage of disease at diagnosis to reflect this.

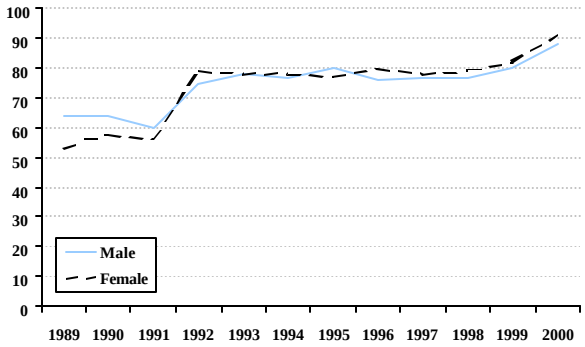
Treatment

Lung cancer is difficult to treat. It is often not discovered until the later stages of the disease, and therefore, has often progressed too far to have it all removed. Surgery is usually used to treat non-small cell lung cancer, while other treatment options are usually used for small cell lung cancer. Surgical options for lung cancer include segmental resection, lobectomy, or pneumonectomy. Respectively, these procedures remove a section of the lung, a lobe of the lung, or an entire lung. Non-surgical treatment options for lung cancer include chemotherapy, radiation therapy, photodynamic therapy (PDT; chemical injection followed by laser treatment), or clinical trials. (RICAN)

The percent of lung cancer cases in RI ACOS-approved treatment programs and the percent staged with AJCC staging methodology is detailed below.

Figure 9-11. Lung cancer in ACOS programs by year and sex

Percent of lung cancer cases treated in ACOS approved cancer treatment programs by year and sex, RI, 1989-2000.

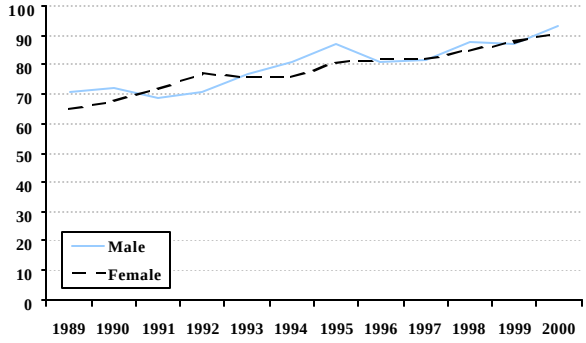


Source: RICR, HEALTH

The percent of lung cancer case reports from ACOS approved hospital cancer treatment programs in RI was in the 60s among males and in the 50s among females from 1989 to 1991. In 1992, this proportion increased to just below 80% for both males and females, and remained there until it increased in 2000 to 88% for males and 91% for females.

Figure 9-12. Lung cancer with AJCC staging by year and sex

Percent of lung cancer cases staged with AJCC staging methodology by year and sex, RI, 1989-2000.



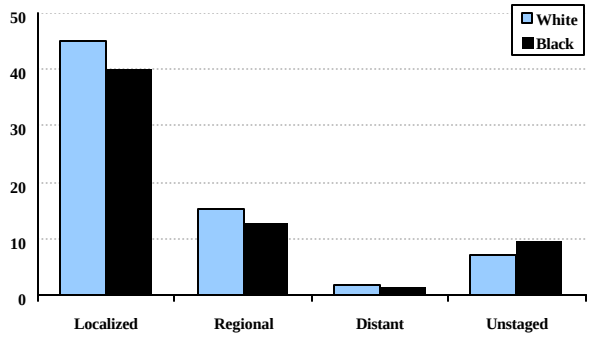
Source: RICR, HEALTH

From 1989 to 2000, the percent of newly diagnosed lung cancer cases staged using the AJCC system, steadily increased from 71% to 93% for men, and from 65% to 91% for women.

Survival

Figure 9-13. Male lung cancer survival rates by race and stage

Five year relative invasive lung cancer survival rates by race and stage of disease at diagnosis among males, US, 1992-1999.*



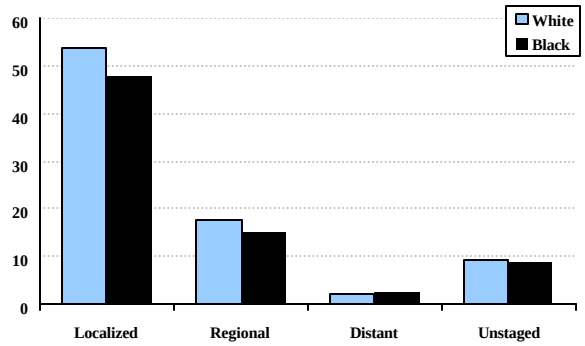
* Survival rates are relative rates expressed as percents
Source: *SEER Cancer Statistics Review, 1975 -2000.*

Based on US data from 1992-1999, five-year relative survival rates for male lung cancer are higher when diagnosed at earlier stages of disease, and are generally slightly higher among white males than black males. Lung cancers diagnosed while localized have a survival rate of 45% among white males and 40% among black males. Cancers that are not diagnosed until a distant stage have a survival rate of 2% among both white and black males.

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Figure 9-14. Female lung cancer survival rates by race and stage

Five year relative invasive lung cancer survival rates by race and stage of disease at diagnosis among females, US, 1992-1999.*



* Survival rates are relative rates expressed as percents
Source: *SEER Cancer Statistics Review, 1975 -2000.*

Based on US data from 1992-1999, five-year relative survival rates for female lung cancer are higher when diagnosed at earlier stages of disease, and are generally slightly higher among white females than black females. Lung cancers diagnosed while localized have a survival rate of 54% among white females and 48% among black females. Cancers that are not diagnosed until a distant stage have a survival rate of 2% among both white and black females.

[Note: Separate graphs for males and females may not have the same y-axis scale.]

Discussion

Summary of Burden

Lung cancer contributes substantially to the cancer burden in Rhode Island.

Lung cancer is the second most commonly diagnosed cancer and the leading cause of cancer death. Approximately 1,500 Rhode Islanders alive today were diagnosed with lung cancer at some point in the past 25 years.

In Rhode Island, lung cancer mortality decreased among men and increased among women in the 1990's.

These changes reflect smoking trends of past decades.

Relative Burden

In the 1990's, the burden of lung cancer in Rhode Island surpassed that of the nation as a whole.

Among men, lung cancer rates decreased faster at the national level than in Rhode Island, creating a differential. Among women, lung cancer rates increased faster in Rhode Island relative to United States, creating a differential.

Disparities

In Rhode Island, black men were more likely to be diagnosed with lung cancer than white men in the 1990's.

At the national level, this racial disparity was considerably larger.

Among persons diagnosed with lung cancer in Rhode Island, black persons were more likely to die from the disease than white persons in the 1990's.

Kent, Providence, and Washington counties bear a greater burden of lung cancer than the nation as a whole.

Higher lung cancer mortality likely indicates higher rates of smoking or exposure to smoke in these areas, and is worthy of further study to test this and other possible reasons for the differential.

Status of Control Strategies

The burden of lung cancer may be lessened by reducing tobacco use, by reducing exposure to second-hand smoke, and by assuring state-of-the-art treatment for all lung cancer patients. Over the past forty years, more than 20 Surgeon General's reports (NIH) and countless studies have confirmed that both cigarette smoking and environmental tobacco smoke cause lung cancer. Lung cancer is a preventable cause of death, and with no effective screening procedures or treatments, the reduction of tobacco use is crucial. (HP) As such, a primary control strategy for lung cancer in RI is to reduce the proportion of current smokers and to reduce exposure to second-hand smoke. This presents a challenge because heavy advertisement from economically powerful companies continues to attract new consumers, and the drug's highly addictive nature makes smoking cessation difficult. Another important control strategy is to assure state-of-the-art treatment for all cancer patients through improvement of basic treatment infrastructure.

The Tobacco Control Program has worked to reduce the proportion of Rhode Islanders who currently smoke and to reduce exposure to environmental tobacco smoke.

Based at HEALTH, the Rhode Island Tobacco Control Program aims to prevent tobacco use among youth, promote smoking cessation, eliminate environmental tobacco smoke, and eliminate tobacco use disparities. Increasing cigarette tax and restricting youth access to tobacco are notable achievements. However, more needs to be done to reduce exposure to environmental tobacco smoke and to increase tobacco program funding.

By the year 2000, 9 out of 10 lung cancer case reports in Rhode Island were from American College of Surgeons (ACOS) approved hospitals.

By the year 2000, 9 out of 10 lung cancer tumors in Rhode Island were staged with American Joint Committee on Cancer (AJCC) methodology.

Cancer Control Priorities for 2004

Reduce the burden of lung cancer by reducing the proportion of people who are current smokers and by reducing exposure to second-hand smoke.

Reduce the proportion of Rhode Islanders who are current smokers and reduce exposure to second-hand smoke by supporting the Tobacco Control Program in (a) preventing tobacco use among youth, (b) promoting tobacco cessation, and (c) eliminating environmental tobacco use.

Reduce the burden of lung cancer by increasing the proportion of lung cancer patients who receive state-of-the-art treatment.

Monitor the literature on the effectiveness of lung cancer screening.

Ongoing studies may help decide whether or not lung cancer screening reduces the burden of this disease.

Begin to eliminate disparities by identifying reasons for disparities in relative mortality.

Identify reasons for racial and geographic disparities in relative mortality, using data from the Rhode Island Cancer Registry, the Behavioral Risk Factor Surveillance System, the Rhode Island Health Interview Survey, and death certificate data. Address racial disparities in Rhode Island lung cancer incidence and mortality that are not present at the national level.